

who have had experience in different sections of the country believe that this frequency of and mortality of lobar pneumonia is less in our State than in the eastern centers having a more rigorous winter climate.

✽

EDWIN L. BRUCK, M. D. (384 Post Street, San Francisco).—We have had no experience whatever with the treatment of pneumococcus pneumonia by the use of potassium permanganate as described by Dr. W. E. R. Schottstaedt. It does not seem to us that the amount of nascent oxygen produced by the installation of such small amounts of potassium permanganate into the rectum would be of any material benefit to the patient, because it is inconceivable that this type of therapy would do anything that other methods of oxygen administration would not do.

Our experience with the treatment of pneumonia has been spread out throughout the past two years, during which time we saw 327 cases of pneumococcus pneumonia. It is imperative that before one attempts to evaluate the beneficial effects of therapy, certain other studies be made. First, typing is important. Secondly, the presence or absence of a positive blood culture is extremely important. It is also well to be acquainted with the fact that the severity of pneumococcus infection varies greatly from year to year. For instance, out of 250 pneumonias in the year 1932-1933, we saw only sixty Type 1, whereas out of seventy-seven pneumonias in the year 1933-1934, we saw fifty-two Types 1. Our Types 1 of 1932-1933 were treated (about 50 per cent) with use of Felton's antipneumococcic serum in large doses, and 50 per cent of them without, by the ordinary methods of nursing. In 1933-1934 none of them received Type 1 serum, and our mortality figures are essentially the same. Let it be stated here that of all of our pneumococcus infections of 1932-1933, about 50 per cent of them had a positive blood culture. The same figure was true in 1933-1934. Of the patients that had positive blood cultures, 60 per cent of them died in 1932-1933, no matter what the type of treatment. Likewise, 60 per cent died in 1933-1934, no matter what the type of treatment. Whereas with negative blood cultures, 19 per cent died in the first year, and 18.8 per cent died in the second year.

Our impression about serum is that it is of no value and is not necessary in those cases where there is a negative blood culture, because our figures would show that the difference in mortality, with negative blood cultures, with the use of serum and without the use of serum is negligible; whereas in positive blood cultures there is possibly some benefit from the early use of large amounts of specific serum, particularly in Type 1.

An interesting by-product of our investigation was a more or less accidental finding while trying to make studies on the chemistry of the chlorids during the course of lobar pneumonia. Chlorid is apparently excreted through the skin and is taken up in the exudate of the pneumonia; by replacing this chlorid with sodium chlorid by mouth, or sodium chlorid subcutaneously, we found that distention of the abdomen quickly disappeared. We later used this as a therapeutic measure and found that the administration of 25 grams or more of sodium chlorid daily in those pneumonia patients with tympanites had a universally beneficial effect upon this complication.

We have used artificial pneumothorax in the treatment of our pneumonias in sixteen patients. Of these, four died, one of whom had a positive blood culture Type 1; one had a Type 1 infection, was eight months pregnant and delivered her fetus during the time of her pneumonia. Her blood culture was negative. The third death was in a man who had a Type 6 pneumococcus in the sputum, and Type 6 in his blood stream, and died of a pneumococcus meningitis, Type 6. The fourth death was in a patient who had a pneumococcus Type 1 in his sputum and a negative blood culture.

These results tally very well with those of Behrend and Cowper, who treated eleven cases with artificial pneumothorax and reported their results in the *Journal of the American Medical Association* for June, 1934. Two of their patients died, one of whom died having a meningitis, which implies a positive blood culture, while the other was a Type 4 pneumonia in which organisms were present in the blood stream.

With regard to artificial pneumothorax we have no settled convictions regarding its efficiency as a method of treatment. We do know that pleural pain is promptly relieved, and that the disadvantage of using pain-relieving drugs is avoided. We intend to pursue this further.

To sum up our experience, we must conclude that high mortality rates accompany pneumococcus and bacteremia, no matter what the method of treatment. That the lowest mortality rates are in those patients who have negative blood cultures. That Type 1 antiserum is apparently of some therapeutic benefit in those cases of lobar pneumonia in which pneumococcus Type 1 is the etiological agent, and in which there is a bacteremia. That artificial pneumothorax as a method of therapy is an interesting experiment. That previous data in the literature, on this type of treatment, are of no value because of the lack of sufficient data upon bacteremia and the influence of such bacteremia upon mortality rates.

SOME CONTRIBUTIONS BY ANIMALS TO HUMAN HEALTH†

By A. C. Ivy, Ph.D., M.D.
Chicago, Illinois

INTRODUCTION

THE most universal curse on all living things is disease. Yet, how many people truly realize what biological science has done to eradicate disease from plants, animals and man. Very few, indeed. Why? Because our school histories record the story of wars, political events, and discoveries pertaining to improvements in methods of communication and transportation and say nothing, or little, of the ravages of pestilence and epidemic disease which has so frequently stricken mankind with horror and has ruthlessly destroyed the lives of hundreds of thousands of people.

In 1911 the average span of life was approximately fifty-three years. Today it is sixty years. This means that there are thirteen million people alive in the United States today who would otherwise be dead if the average life span of even the year 1911 still held in 1934.

Most of the medical science that we know today has been discovered within the past one hundred years. The average span of life one hundred years ago was thirty-five years. This means that if the average span of life had not increased to its present mark, fifty million people living in the United States today would be dead; almost one-half of the population.

† EDITOR'S NOTE: This article presents the explanatory legends used in one of the exhibits of Northwestern University at the Century of Progress Fair at Chicago, to which editorial reference is made in this issue (page 272). CALIFORNIA AND WESTERN MEDICINE is indebted to the courtesy of Professor Ivy not only for these legends, (to secure which it was necessary for him to send an assistant to the Fair Grounds, to make a copy), but also for the introductory comments which are here printed.

The various exhibits were prepared by Professors J. P. Simonds, C. J. Farmer, A. C. Ivy and A. A. Day.

If the increase of the average span of life, which affects the pocket book of every person who has an insurance policy and pays taxes, has not been due to medical science, to what has it been due? A frequent reply is "sanitation." The person who usually makes such a reply is ignorant of the fact that sanitation is the product of medical science and is universally directed and supervised by medical scientists. They forget that the Panama Canal could not be built until after the cause of yellow fever was discovered. They forget that chlorination of city water supplies could not be practiced until it was discovered that chlorination would kill typhoid germs and that typhoid was due to a specific germ. They forget that plague could not be effectively stopped until it was found that it was due to a germ and that the flea, rat and ground squirrel may carry the germ. They forget that when crops are threatened with disease, when animals are dying of unknown cause, and communities are stricken with the horror of epidemic disease, the legislators and citizens look immediately to biological and medical scientists for aid and relief.

It is sad, but nevertheless true, that sixty persons die every hour in the United States—we believe the most enlightened and humanitarian country in the world—of a preventable disease, such as smallpox, diphtheria, typhoid, plague, etc. This is not due to the lack of information on the part of medical science, but it is due either to the prejudice, ignorance or negligence of the public and law makers. This is plain language, but history reveals that it takes plain language to cause people to appreciate the truth. To be tactful is wise; to mince words is to manifest a lack of courage and to subvert the truth.

How is medical progress and science effected? It is effected in a combination of three ways. One is the discovery of a disease, its identification and natural history. Another is the application of physiology, its principles of function and how function is affected by disease. And, the third is experimental work on patients. The humane use of animals is absolutely necessary. Animal experimentation is the outstanding method of medical science. In biology living things must be used; in physics and chemistry inanimate things are used. *Animal experimentation* is not only humane, but is a manifestation of the highest type of humanity in that it *prevents unnecessary and random experimentation on man*.

Since one of the aims of the Century of Progress was to educate and lead people to appreciate the good that man has derived from the scientific advancement of the past one hundred years, the medical scientists of Northwestern University thought it was fitting that some of the contributions made by the helpers of man—the lower animals—to human and animal welfare alike, should be exhibited. A modest, inexpensive exhibit was all that could be afforded. In spite of the fact that the subject could only be exhibited very incompletely and without drama and a loud noise, the exhibit has attracted much attention and has been of definite educational value.

At the request of the editor of CALIFORNIA AND WESTERN MEDICINE, the following outline of the exhibit is submitted:*

I

CONTRIBUTION OF ANIMALS TO HUMAN HEALTH

Mouse and Rat

CANCER

Heredity is an important factor in cancer of mice. It is not known to be so important in humans. "Tar cancer" can be induced in mice by the application of coal tar. Transplantation of cancer from mouse to mouse reveals the danger of handling cancers roughly. These little animals may help solve the riddle of cancer.

PNEUMONIA

Pneumonia is caused by the predominance in the lungs of one of several types of pneumococcus organisms. The mouse is used to diagnose the type, to determine the special kind of serum for treatment, and to standardize these serums which aid the patient to recover.

VITAMINS

Rats, because of their size and response, are ideal subjects for the study of these essential factors.

Vitamin A

Growth-Promoting

Vitamin A is found most abundantly in butter, milk, egg-yolk, tomato, carrot, cod and haliver oils. Its absence from the diet causes failure of growth, disturbances of vision, keratinization of epithelial membranes, lowered resistance to infection, even sterility.

Vitamin B

Beriberi

Vitamin B is found most abundantly in whole cereal grains, yeast, egg-yolk, and green vegetables. Its absence from the diet causes beriberi, nervous disturbances, poor lactation, decreased appetite, and loss of tone of the gastro-intestinal tract.

Vitamin C

Scurvy

Vitamin C is found most abundantly in oranges, limes, lemons, tomato juice, cabbage, and most fresh vegetables. Its absence from the diet causes scurvy and diseases of the gums and teeth. (The guinea-pig is used in vitamin C experiments.)

Vitamin D

Rickets

Vitamin D is found most abundantly in oranges, cod- and tuna-liver oils, and is also produced by the exposure of ergosterol to ultra-violet. The body, upon exposure to sunlight, is able to produce this factor. Its absence from the diet results in faulty dentition and poor bone formation.

Vitamin E

Fertility

Vitamin E is found most abundantly in wheat germ, lettuce, and watercress. Its absence from the diet of the rat causes a failure of reproduction (sterility.)

Vitamin G

Pellagra

Vitamin G is found most abundantly in yeast, glandular organs used for food (liver and kidney), fresh leafy vegetables, bananas, and tomatoes. Its absence from the diet results in skin eruptions, gastro-intestinal and nervous symptoms (pellagra). The distribution of yeast by the Red Cross to the people in the depression stricken areas of the South has almost eradicated this "depression disease."

Guinea-pig

DIPHTHERIA AND TETANUS

Antitoxins have reduced the death rate from diphtheria and tetanus. The potency of each lot of anti-

* EDITOR'S NOTE.—On the walls of the exhibit booth, to the left of these explanatory legends, were grouped specimens, sections and photographs, designed to clarify the statements made in the text of the legends.

toxin can only be determined by testing its power to protect guinea-pigs against a fatal dose of diphtheria or tetanus toxin.

TUBERCULOSIS

Tuberculosis of the kidney can be detected in its early stages only by injecting sediment from the patient's urine into a guinea-pig and noting certain diagnostic signs.

This is a most delicate and valuable test.

DIPHTHERIA

Guinea-pigs are used:

To test toxin for use in the Schick test to determine susceptibility to diphtheria.

To test toxoid for preventive immunization against diphtheria.

To test the virulence of the germ in cases of diphtheria carriers.

SYPHILIS

The guinea-pig furnishes the "complement" for the Wassermann or blood test for syphilis.

This test is of great value in diagnosing and controlling treatment of the disease.

GLANDERS

Glanders in man and in the horse is almost invariably fatal.

The guinea-pig is a valuable aid in diagnosing and, therefore, in preventing this disease.

INFECTIOUS JAUNDICE

Infectious jaundice (Weil's disease) can be readily diagnosed by injecting the patient's blood or urine into a guinea-pig.

HYDROPHOBIA

Injection of an emulsion of the brain of a dog suspected of having rabies into the brain of a guinea-pig will establish the diagnosis in doubtful cases; effective treatment may then be instigated.

Dog

ETHYLENE ANESTHESIA

In searching for a less upsetting anesthetic than ether, the superior properties of ethylene gas were discovered. This and many pain-killing and sleep-producing drugs used in medicine have been discovered by using the dog as an experimental animal.

HOOKEWORM INFECTION

The parasite called "hookworm" infects the intestines of man and dog.

Experiments to relieve the dog of this destructive parasite led to the discovery of drugs which eliminate the worm from man and dog without harm to the host.

SURGICAL ADVANCEMENT

Many new and difficult operations have been first tried and perfected upon an anesthetized dog. Much of the pioneer knowledge of delicate brain, nerve, lung, heart, stomach, and blood-vessel operations we owe to the assistance of these canine helpers.

INSULIN FOR DIABETICS

The experimental removal of a dog's pancreas caused sugar to appear in the urine.

The "laboratory" diabetes thus produced resulted in the discovery of insulin, which is an extract of beef pancreas. Two million in the United States will benefit from this discovery.

ADDISON'S DISEASE

When the tiny adrenal glands of a healthy dog were removed the dog died with symptoms like those of a man afflicted with the always fatal Addison's disease.

An extract from these same glands yielded "cortin," which today relieves the sufferers of this formerly fatal disease.

STOMACH

Gastric Ulcer

Digestion

This photograph* is of Ajax, a dog living happy and well, ten years after the removal of his stomach. The information thus gained has been applicable to patients suffering from stomach diseases such as ulcer, indigestion, and pernicious anemia.

LIVER

Anemia Prevented

and

Relieved

Feeding liver to dogs with anemia (pale, thin blood) caused red blood corpuscles to be abundantly formed. This discovery has made possible the control of pernicious anemia in man by using fresh liver or concentrated liver extract.

GALL-BLADDER

Gall-Bladder Colic

and

Stones

It was found that certain substances could be administered to a dog that were secreted in the bile, which made an x-ray of the gall-bladder possible. Applying this fact to man, the gall-bladder can be seen to fill and empty, thus detecting disease and stones.

PARATHYROID

Nervousness

and

Convulsions

When a dog's parathyroid gland is removed a nervous excitable state with convulsions, and even death, results, due to the inability of the body to use its lime or calcium. Extracts from this gland now save the lives of many patients.

RICKETS

Bone Deformity

Growth-Stunting

Rickets was formerly a common disease.† Now, due to experiments upon puppies, it is possible to prevent deformities through dietary management.

Rabbit

Syphilis

Wassermann or "Blood Test"

From the rabbit is obtained one essential ingredient of the test—the "amboceptor." This is often the only means of diagnosing this disease.

Pregnancy

Modified Aschheim-Zondek Test

The rabbit is used in this very reliable test for pregnancy in its earliest stages and for the differential diagnosis of a special type of tumor (chorio-epithelioma).

Diabetes

Assay of Insulin for Treatment

Overdoses of insulin cause convulsions, unconsciousness, and even death. The potency of each lot of insulin must be tested on rabbits before it is given to human patients.

Hydrophobia

Anti-Rabic Virus for Its Prevention

This efficient prophylactic against this terrible and always fatal disease is the injection of ground-up, dried spinal cord or brain of a rabbit dead of rabies.

Cancer

Its Experimental Production

Two Japanese scientists discovered that painting a rabbit's ear with tar produced cancer. Much of our modern knowledge of cancer has resulted from this discovery.

Anemia

Diseases of the Blood-Forming Organs

The red cells and leukocytes of the blood are formed in the bone marrow, which can be studied very conveniently in rabbits. Much has been learned from this source.

* Reference is to the photograph of the dog named Ajax, placed to the left of the legend.

† This legend referred to accompanying photographs of puppies.

Horse**Antiserums**

Horses produce the antiserums used successfully in the treatment or prevention of diphtheria, tetanus (lockjaw), epidemic meningitis, snake bite, botulism, pneumonia, and of scarlet fever.

Cow**Smallpox****Vaccine**

This vial contains the lymph from cowpox pustules produced by inoculating the shaved and scarified skin of healthy calves with cowpox virus. Vaccination, discovered by Doctor Jenner in 1798, has reduced smallpox from the terrible pestilence of the eighteenth century to its present rare occurrence in the twentieth century.

ENDOCRINE PRODUCTS

From cattle slaughtered for meat are obtained most of the gland extracts used in the treatment of endocrine deficiencies, such as thyroxin for cretinism and myxedema, parathorome for tetany; and insulin for diabetes.

PERNICIOUS ANEMIA

Extracts of the liver of cattle and of other animals furnish a specific treatment for this disease so uniformly fatal before this method was discovered by experiments on dogs.

Monkey

By the use of the monkey much has been learned concerning the virus diseases which are not transmissible to other laboratory animals. Among these are especially:

INFANTILE PARALYSIS

From the monkey it has been learned that this disease is infectious, that the virus passes from the nose to the central nervous system; that a protective substance is present in the blood serum of many normal adults and can be used in the treatment of the disease.

YELLOW FEVER

By using the monkey a practical method of protective immunization of humans against this disease has been discovered. Had this been known five years ago the lives of Doctor Noguchi and other martyrs to this disease would have been saved.

II**DISEASES TRANSMITTED FROM ANIMALS TO MAN****Cattle**

Undulant fever—Called "infectious abortion." Transmitted to man by milk.

Tuberculosis—Transmitted by milk from tuberculous cows, especially to children.

Septic sore throat—An acute disease acquired from contaminated milk.

Anthrax—Acquired by man from handling the hides of cattle dead of anthrax.

Actinomycosis—Called "lumpy jaw" in cattle. A chronic and usually fatal disease in man.

Tapeworm—*Taenia saginata* is acquired by eating uncooked infested beef.

Cowpox—A mild disease in man that protects him from smallpox. Observation of this fact led Jenner to the discovery of vaccination.

Swine

Trichinosis—A very painful and often fatal disease acquired by eating uncooked or poorly cooked "measley" pork or sausage.

Tapeworm—The tapeworm, *Taenia solium*, is transmitted to man by infested uncooked pork or sausage.

Roundworm—This intestinal parasite may be acquired by man from the pig.

Parathyroid fever, undulant fever, anthrax, and tuberculosis may be transmitted to man from swine.

Goat

Undulant fever—Also called "Malta fever." It is acquired from the milk of infected goats.

Sheep

Anthrax—Sheep are the most common source of this fatal disease which occurs in man in three forms: "wool-sorter's disease," intestinal anthrax, and malignant pustule. Other diseases acquired from sheep are: *Foot and mouth disease* and *liver flukes*.

Mouse

Bubonic plague, tularemia, amebic dysentery, trichina, are spread to man by the mouse.

Rabbit

Tularemia—The rabbit is the chief source of infection in this very severe disease.

Fish

Tapeworm—The "fish tapeworm," *Diphyllbothrium latum* is acquired from eating uncooked infested freshwater fish. Its presence in man causes a severe anemia.

Parrot

Psittacosis—A severe and often fatal disease transmitted to man.

Dog

Echinococcus disease—*Taenia echinococcus*, a small tapeworm which sometimes inhabits the intestine of dogs, gives rise in man to cysts that may be the cause of death.

Hydrophobia—The dog is the animal chiefly responsible for the perpetuation of this disease, so fatal to both man and dog.

Tapeworm—A tapeworm, *Diphyllidium caninum*, may be acquired by man (especially children) from the dog.

Mange—Of the three types of mange from which dogs suffer, one is transmissible to man.

Ringworm—The dog is subject to four types of ringworm which it may occasionally transmit to man.

Scarlet fever—Dogs are susceptible to the scarlet fever germ. Close association of a dog with a child suffering from this disease may endanger other children.

Cat

Hydrophobia—The cat may transmit this disease to man; however, it is not so great a menace as is the dog.

Poliomyelitis (infantile paralysis)—Cases of apparent transmission of this disease to man are on record.

Rat-bite fever—The cat may carry the germ of this disease.

Giardia—An intestinal protozoön which may be acquired by man from the cat.

Rat

Entameba histolytica—The microorganism of amebic dysentery may be harbored by the rat and transmitted to man.

Trichinosis—The rat is the chief source of infection of swine and, therefore, responsible for the perpetuation of the disease.

Bubonic plague—The rat is the chief means of the spread of this terrible disease, especially in cities.

Rat-bite fever—A chronic, disabling disease acquired from a rat bite.

Tularemia and tapeworm—Diseases occasionally transmitted from rats to man.

Horse

Glanders—This is the most serious and frequent disease transmitted from the horse to man. It is fatal to both.

Actinomycosis, foot and mouth diseases, hydrophobia, are diseases occasionally acquired by man from the horse.

Northwestern University,
303 East Chicago Avenue.